

Grid Infrastructures and Beyond

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The Primary Requirement ...



Enabling *People* to Work Together on Challenging Projects: Science, Engineering & Medicine



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Events Held

(from 1 Aug 2002 to 29 Feb 2004 - 31 months)



We have run 197 events (just over 6 per month):

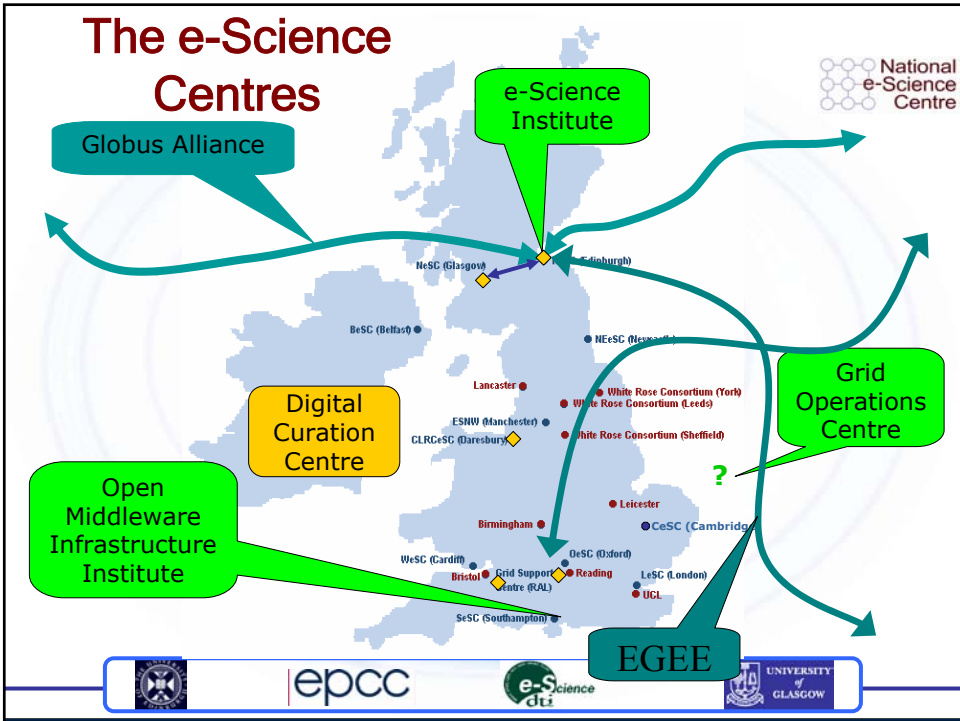
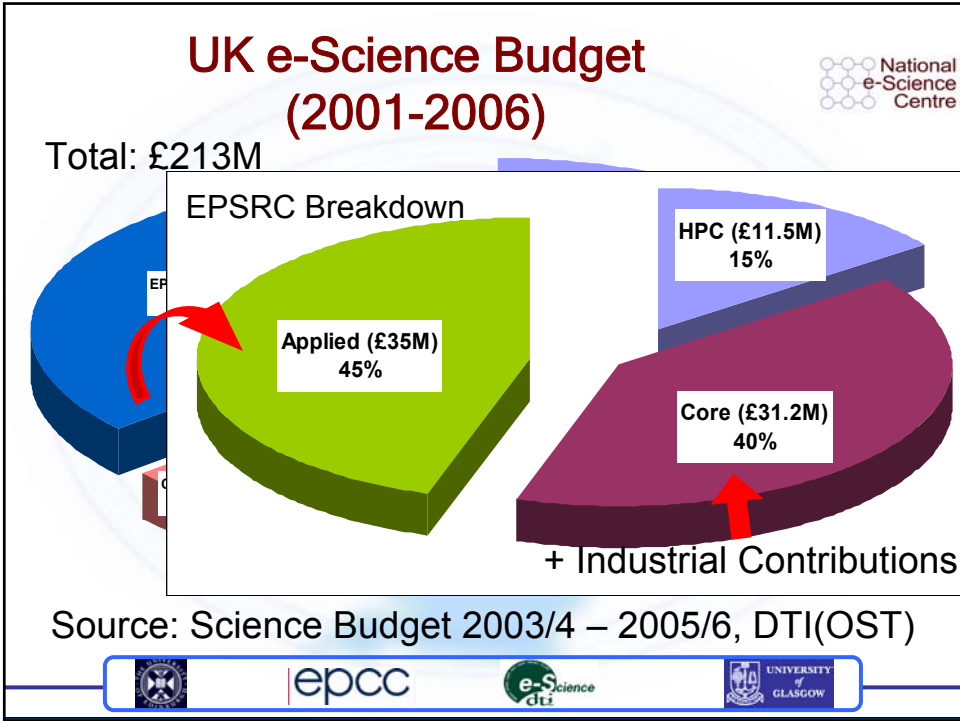
- 3 conferences (including GGF5 with 900 participants)
 - 20 project meetings
 - 23 research meetings
 - 61 workshops
 - 4 schools
 - 32 training sessions
 - 27 outreach events
 - 9 international meetings
 - 18 e-Science management meetings
- **16,444 delegate days**
 - **197 events**
 - **6,825 delegates**
 - **339 event days**

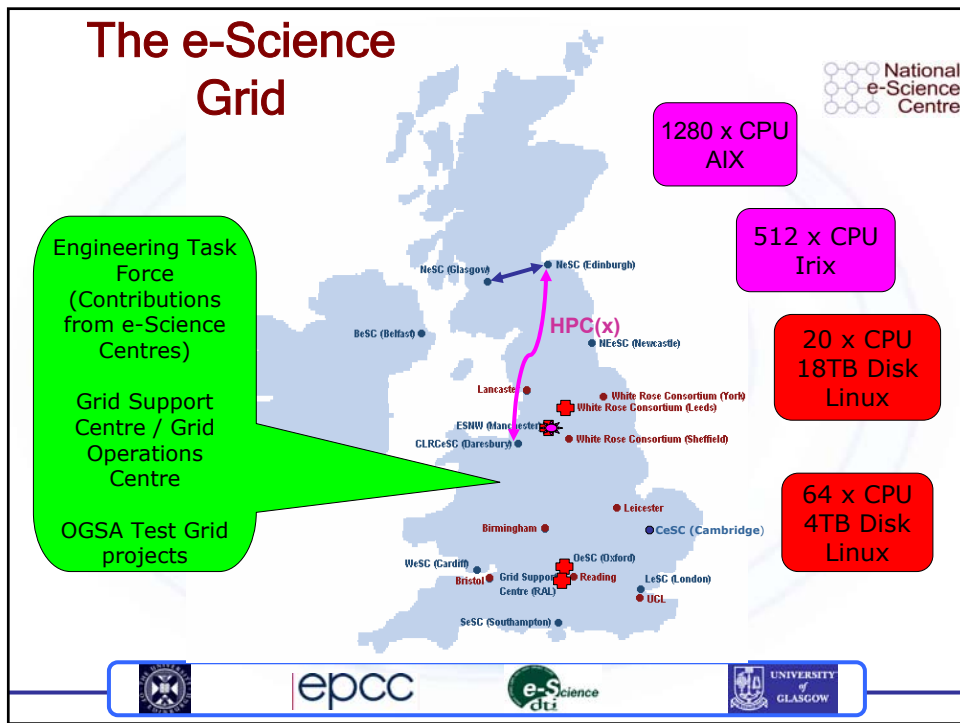
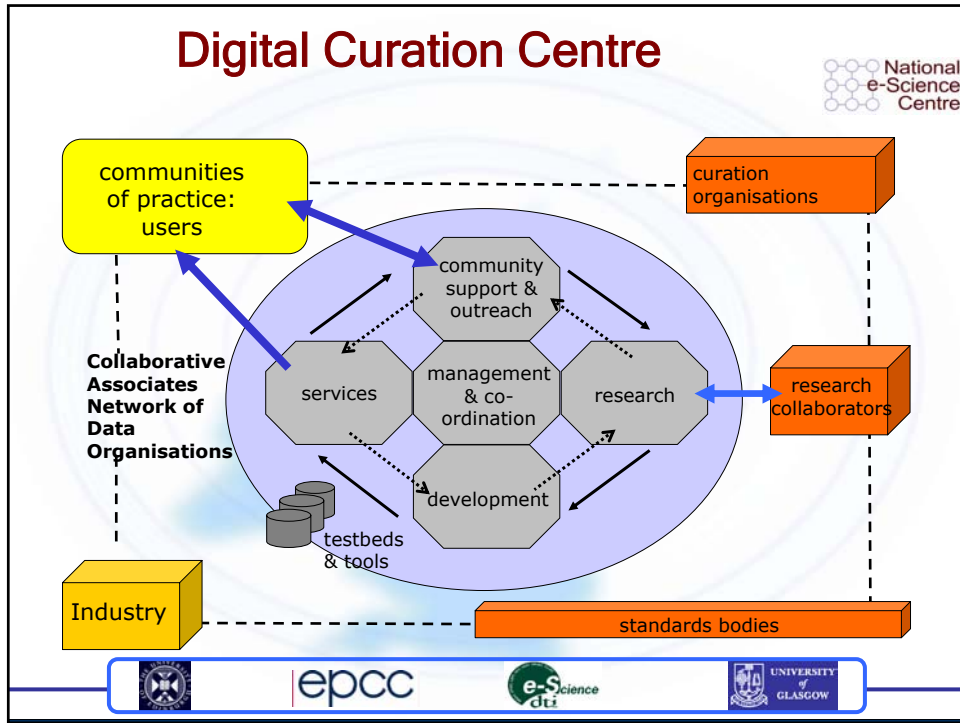
(though the definitions are fuzzy!)



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What is e-Science?

- **Invention and exploitation of advanced computational methods**
 - **to generate, curate and analyse research data**
 - ▶ From experiments, observations and simulations
 - ▶ Quality management, preservation and reliable evidence
 - **to develop and explore models and simulations**
 - ▶ Computation and data at extreme scales
 - ▶ Trustworthy, economic, timely and relevant results
 - **to enable *dynamic* distributed virtual organisations**
 - ▶ Facilitating collaboration with information and resource sharing
 - ▶ Security, reliability, accountability, manageability and *agility*
- **e-Science >> Grid & Web Services**
 - **It is what you do with them that counts**



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Fundamental & Growing Assets

- ***Understanding* of Processes & Requirements**
- ***International and Multi-disciplinary* Skill base**
- ***Experience* composing & adapting existing technologies**
 - **and of building new components**
- ***Experience* Supporting Developers and Users**
- ***Experience* Establishing Virtual Organisations across Enterprise boundaries**

Embedded in People & Teams, Growing – they need nurture



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Primary Multi-Enterprise Issues

- Combining subsystems built independently in different enterprises
- Deploying, Starting and Managing Applications and Production Operations
 - Using a set of combined facilities
 - Independently built
 - Autonomously managed
- Developing software independently
 - Expecting to integrate later
- All for VO communities that retain independence

Assume Benefits of
Shared Infrastructure:
How much?
One size fits all?



Relative Importance

- What envelopes you put your messages in
 - How they are delivered
 - Infrastructure to organise a common technical platform - the foundations of communication



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 - Their patterns of Use - sequences that mean something
 - Their Contents
 - The Grammar and Vocabulary of Communication
 - Agreed Interpretations



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Relative Importance

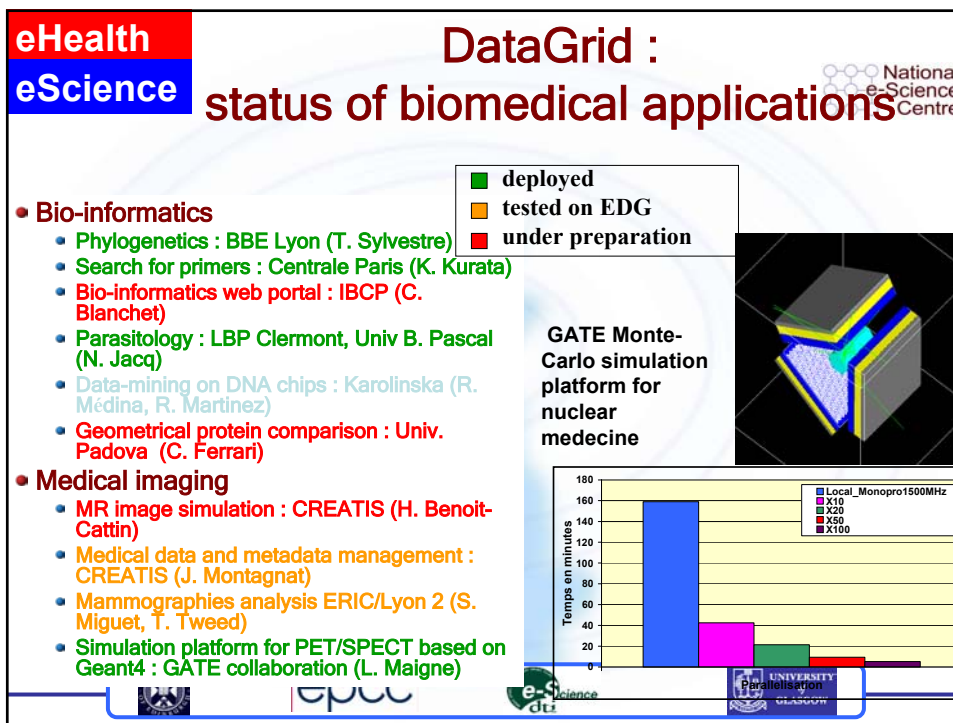
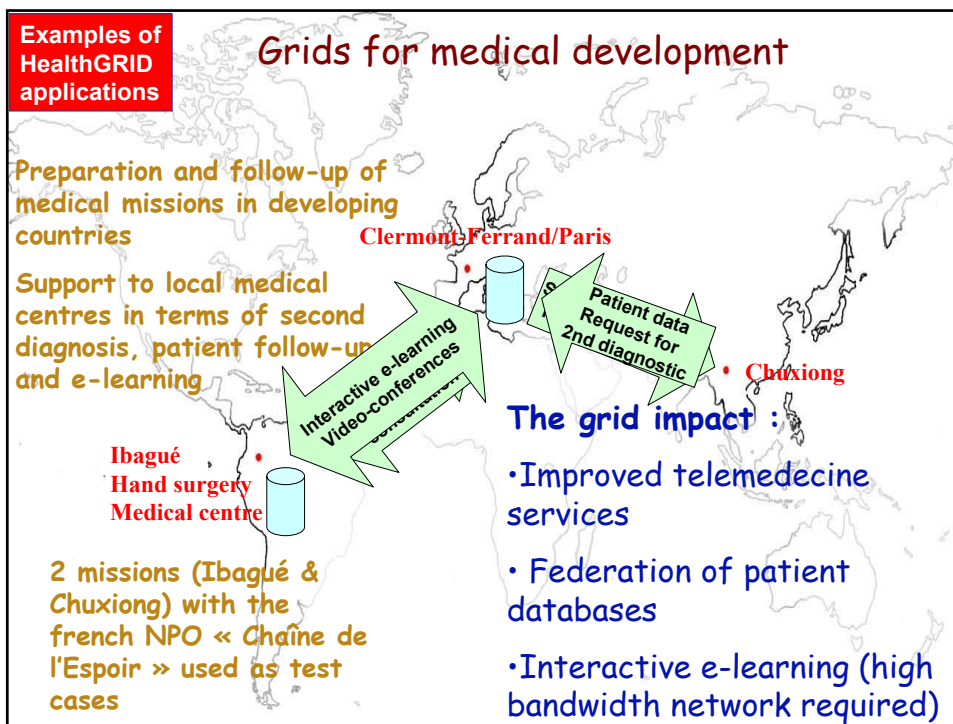
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- **What information you send in your messages**
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- **What you do when you get a message**
 - **The Application Code you Execute**
 - **The Middleware Services**
 - ▶ Security, Privacy, Authorisation, Accounting, Registries, Brokers, ...
 - **Integration Services**
 - ▶ Multi-site Hierarchical Scheduling, Data Access & Integration, ...
 - **Portals, Workflow Systems, Virtual Data, Semantic Grids**
 - **Tools to support Application Developers, Users & Operations**

People



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Some UK e-Health Projects

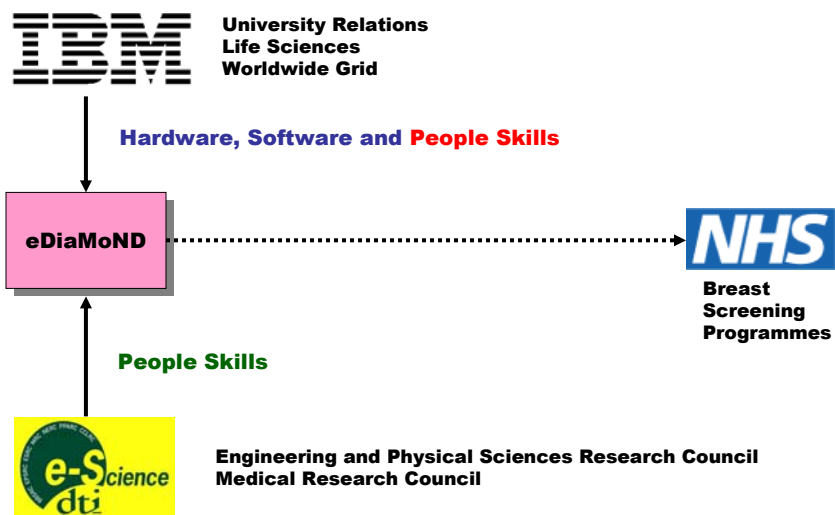
- eDiaMoND (with IBM and Mirada)
 - Breast Cancer Project
- IXI (with GSK and Philips Medical)
 - Information from medical images
- MIAS Devices
 - Mobile sensors for healthcare
- CLEF
 - Integrating medical information



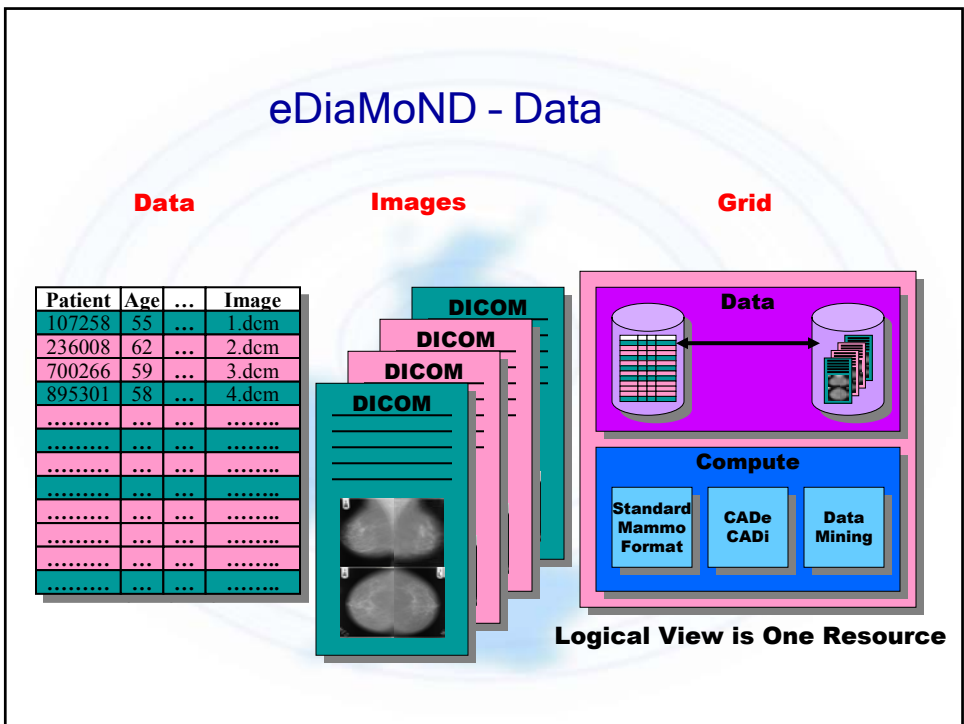
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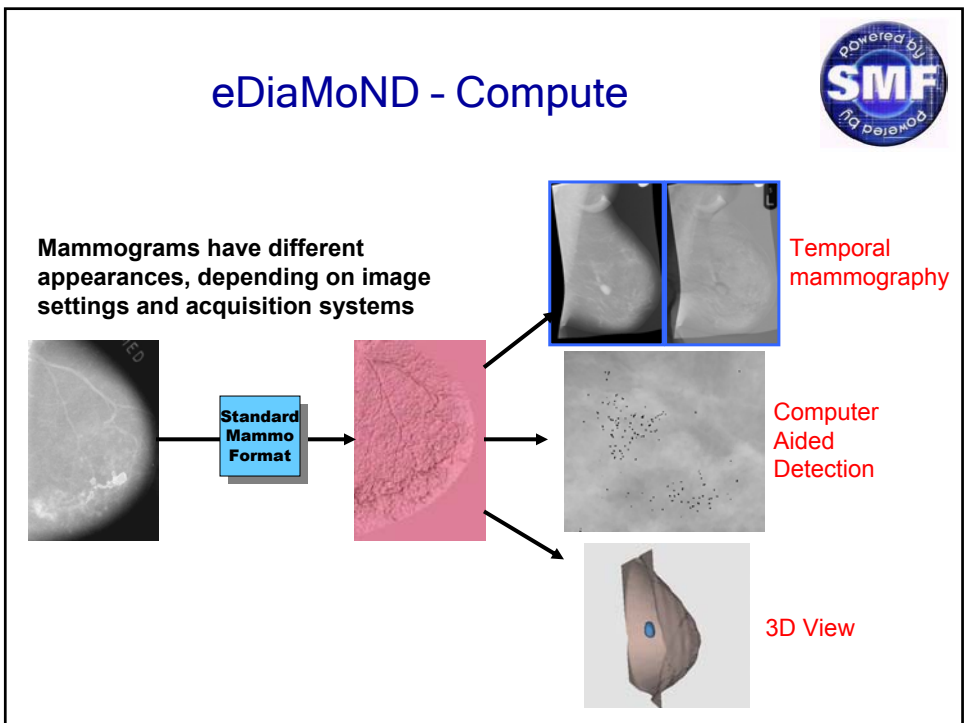
The eDiaMoND Project



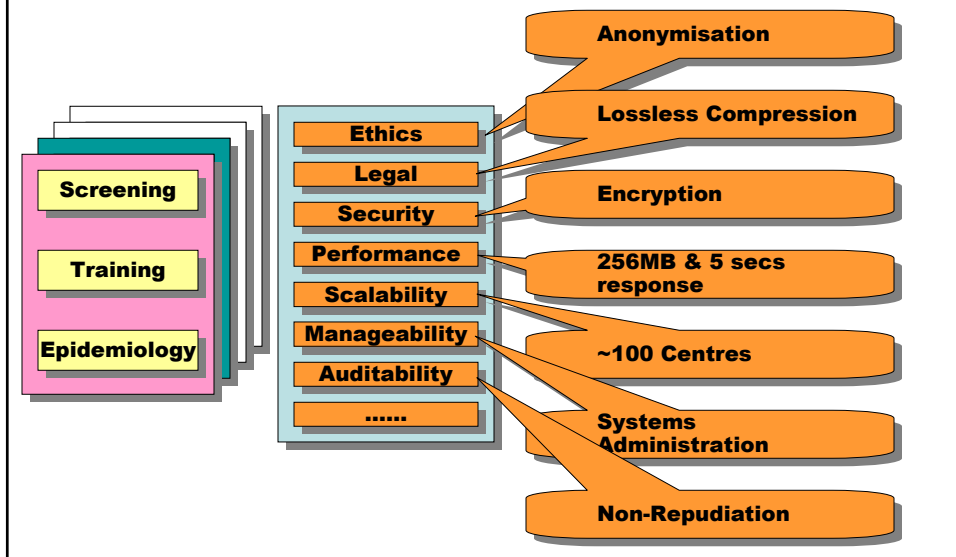
eDiaMoND - Data



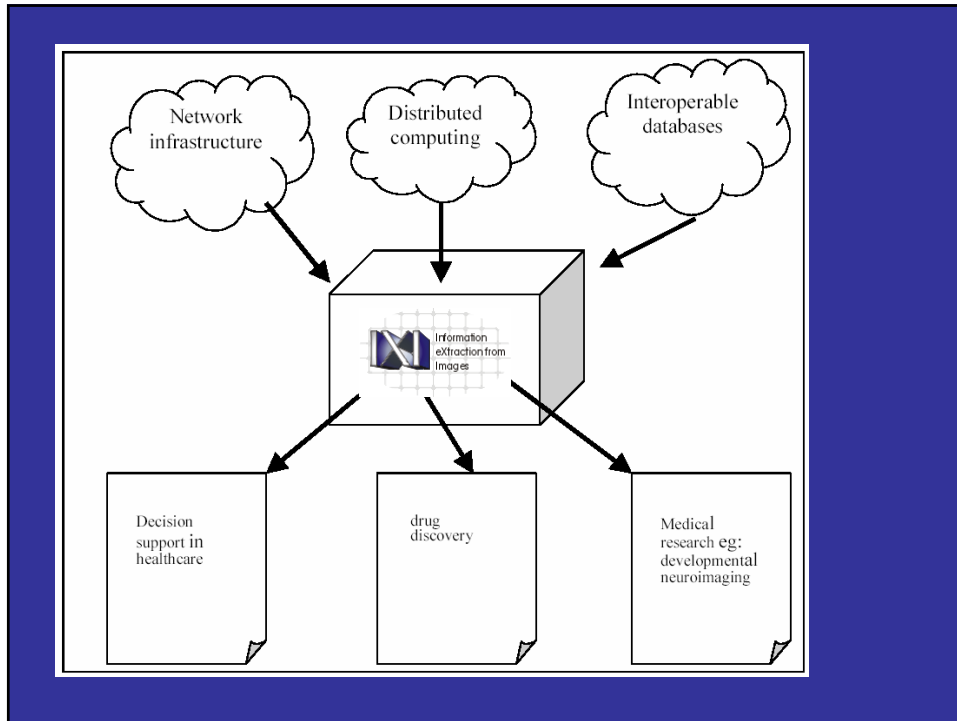
eDiaMoND - Compute



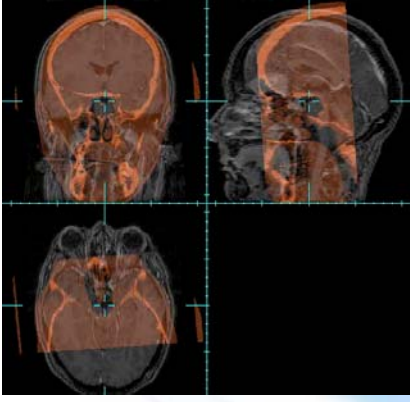
eDiaMoND - Non-Functional



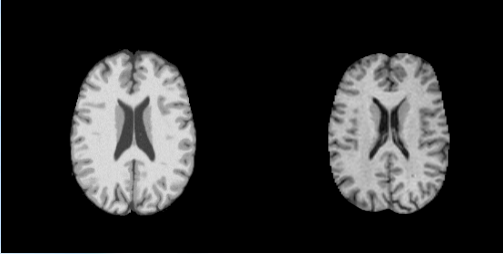
KCL, Imperial and Oxford
<http://www.ixi.org.uk>



Automatic registration technology



Rigid registration of MR and CT images of the head

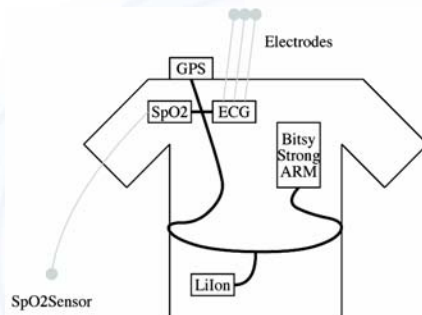


Inter-subject image warping

CLEF - Integrating information

- Need high quality, integrated clinical information for:
 - clinical research
 - evidence-based health care
 - the clinical application of genetic and genomic research
- The capture, integration, and presentation of descriptive information is a major barrier to achieving an integrated framework
- Data includes:
 - clinical histories
 - radiology and pathology reports
 - annotations on genomic and image databases
 - technical literature and Web based resources

MIAS Devices Project



- Easy Plug and Play of Sensors
- Wireless connection using 802.11
- Positioning information from GPS
- Mobile medical technologies on a distributed Grid



Sensor bus



GPS ariel



Where Next for e-Infrastructure

- **Put people and Teams first**
 - The creative force
 - The repository of Experience, Skills and Knowledge
- **Focus on Major Priorities**
 - Developing well-defined Flexible Agreements
 - ▶ Embraced as standards
 - High-level Software Investment
 - ▶ Applications & Requirements led
- **Explore & Evolve Common & Shared Infrastructure**
 - Recognise and respond to differences
 - Celebrate and support commonalities

